



## **Wind Energy in Denmark Is the Past Prologue?**

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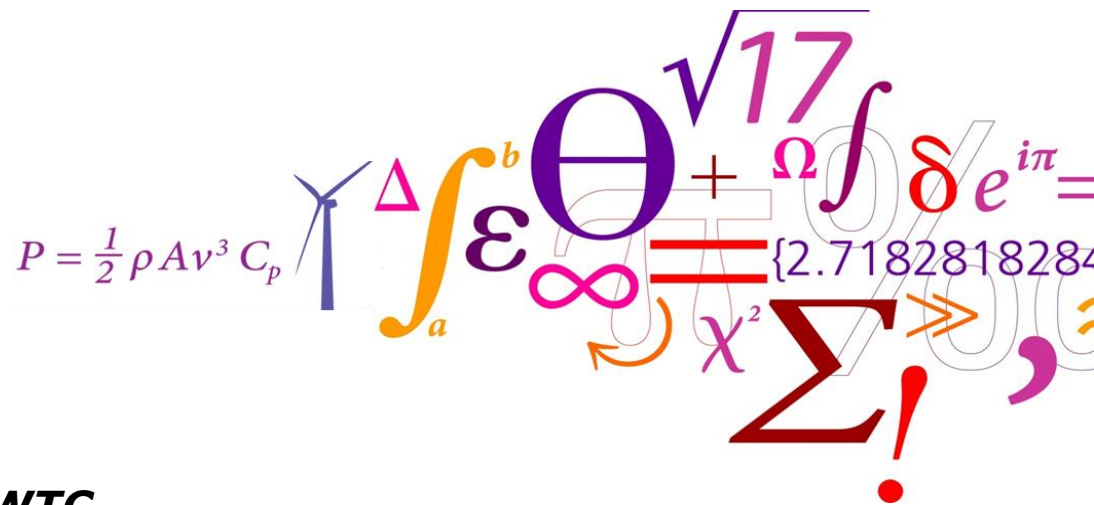
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# Wind Energy in Denmark: Is the Past Prologue?

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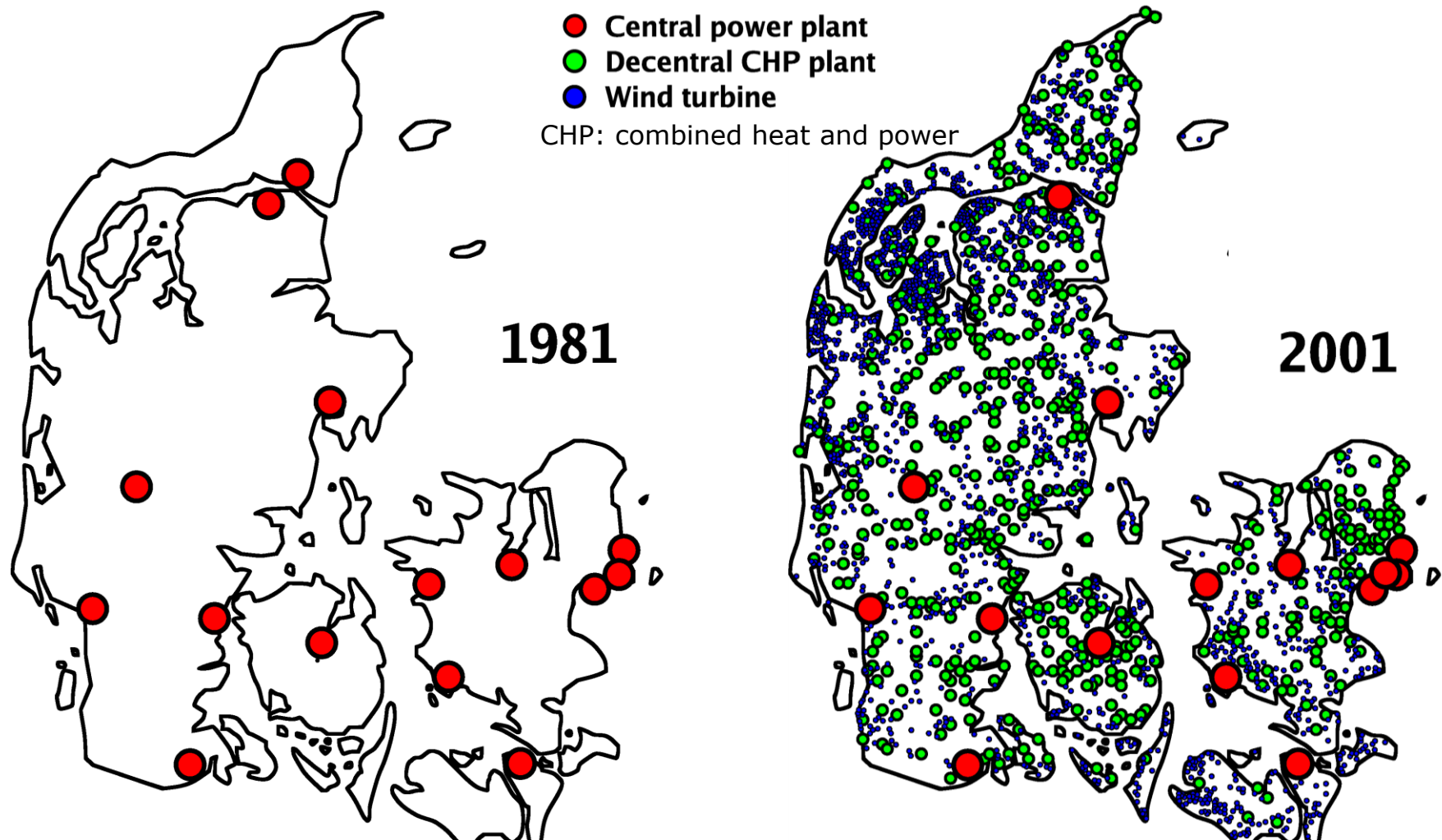
**NWTC**  
**December 11, 2014**

# Is the Past Prologue?



- The siting of wind turbines has proceeded effectively and with strong local (Municipal/ Kommune) support in Denmark
- Anti-nuclear movement
- Bottom-up processes and community ownership patterns
- Local manufacturing & innovations
- Centralized to decentralized energy infrastructure

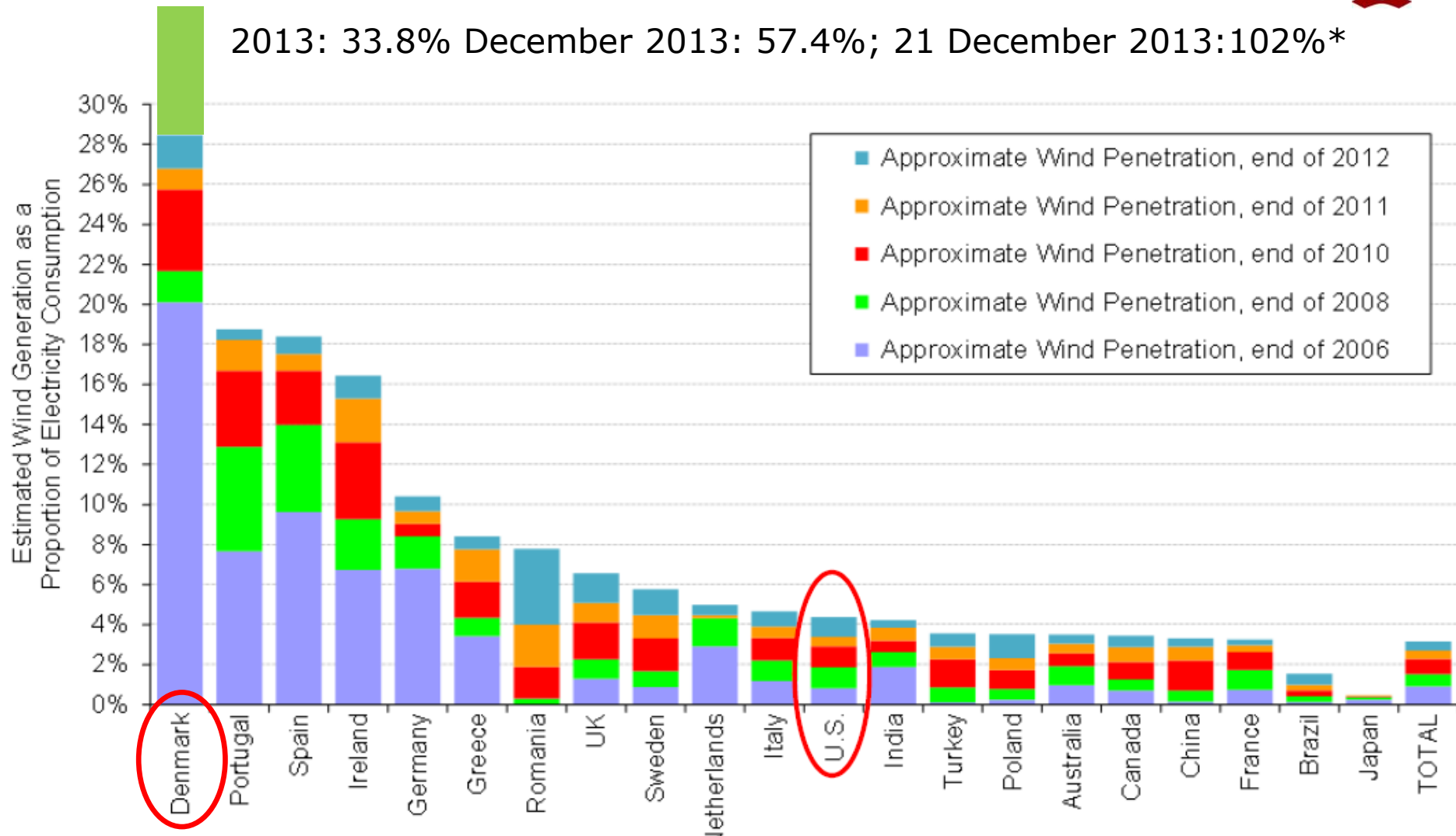
# From centralised to de-centralised system



...from 15 power plants to 415 CHP and 5000 wind turbines

# Wind electricity vs % of electricity demand

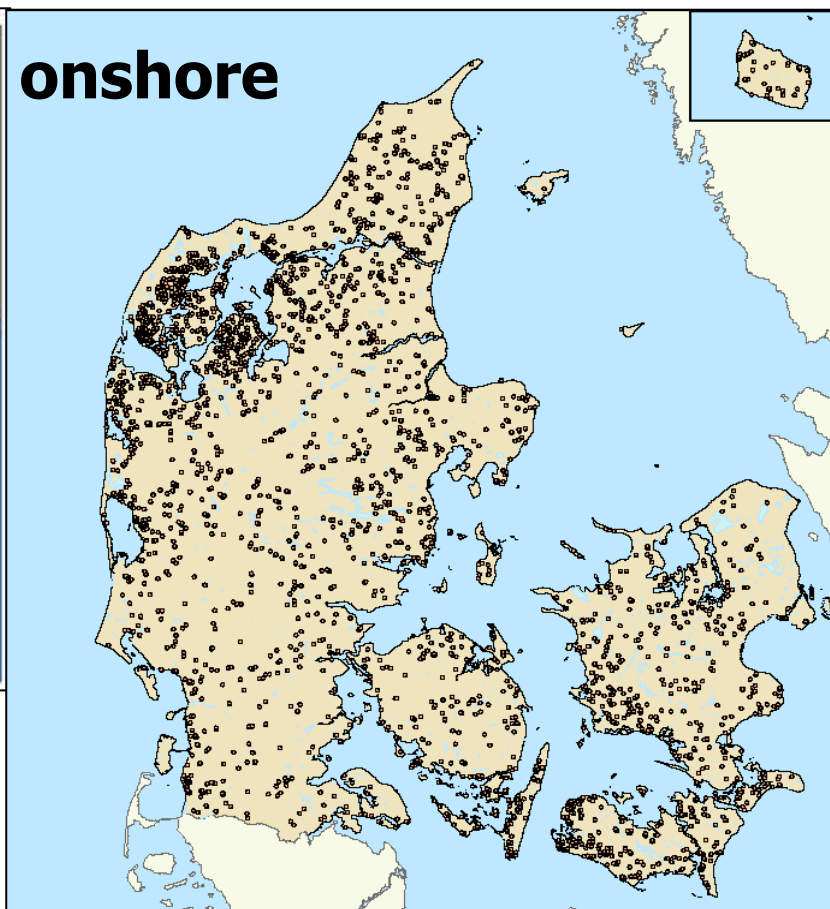
2013: 33.8% December 2013: 57.4%; 21 December 2013:102%\*



Graphic Source: Wiser & Bolinger: 2012 Wind Technologies Market report, L. Berkeley National Lab. Ju

\* Updated Danish statistics: Energinet.dk

# Wind energy in Denmark

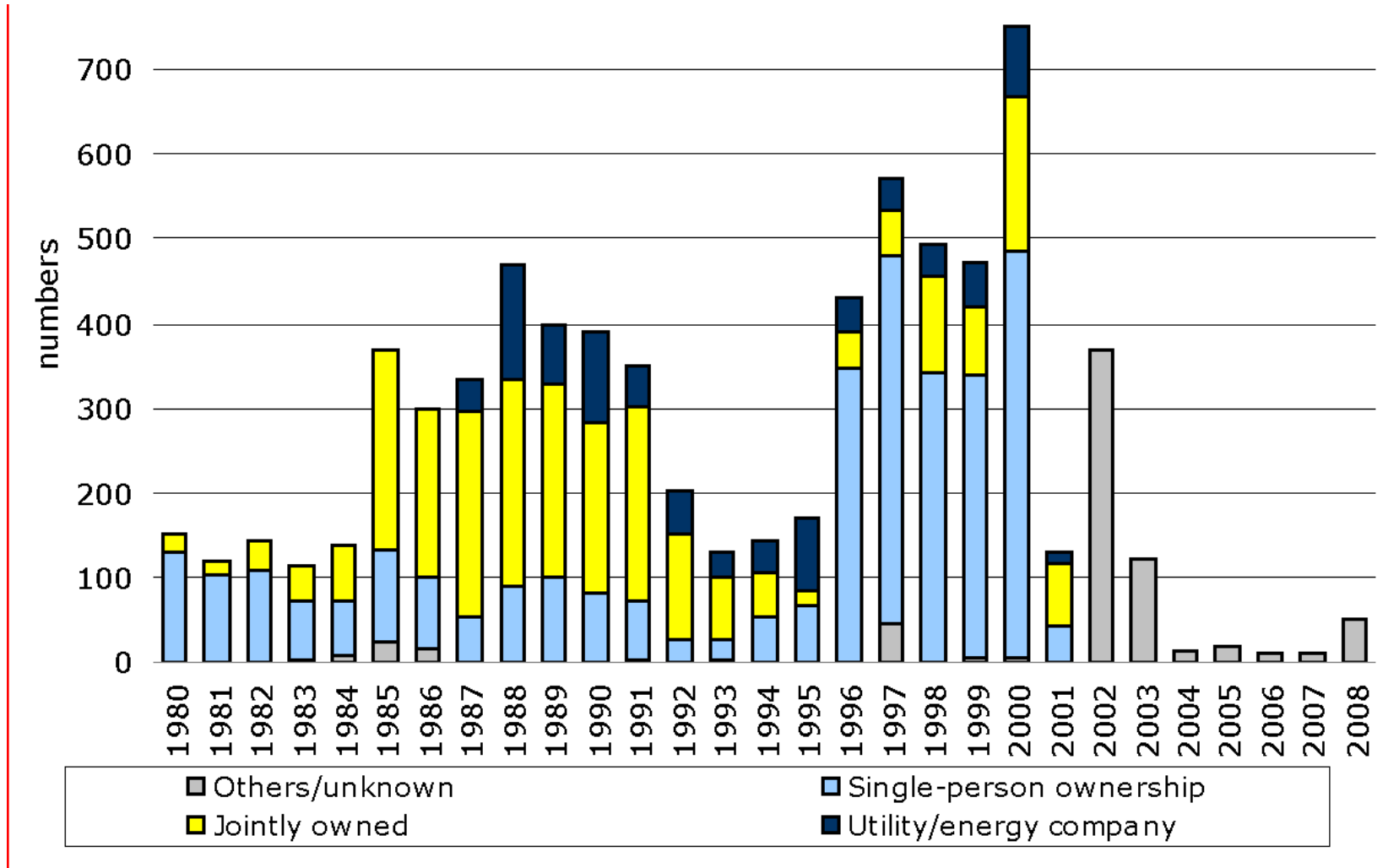


Nov 2013:	4772 MW
Onshore capacity	3501 MW
Offshore capacity	1271 MW (517 turbines)
Turbines	5147

Source: Energistyrelsen Stamdataregister for vindmøller

# Changing Ownership Patterns in Denmark?

- Slide courtesy of Hans Christian Soerensen (2014)



# Danish Governments Energy Policy Goals

## – Our Energy 2020

- 100 % fossil free energy in 2050
  - Electricity, heat supply and transportation
- Political discussions ongoing to add NO COAL by 2025
- Wind goals and current percentages
  - 50% of electricity consumption by 2020
    - In 2013 = 33%
  - Wind = 9% of gross energy consumption in 2020
- EU target for DK:
- Renewable energy covers 30% in 2020, with 10 % in transport (DK expects 35% in 2020)

More information on [www.ens.dk/en-us/](http://www.ens.dk/en-us/)



# WIND PLANNING BY 2020

## Offshore Goals

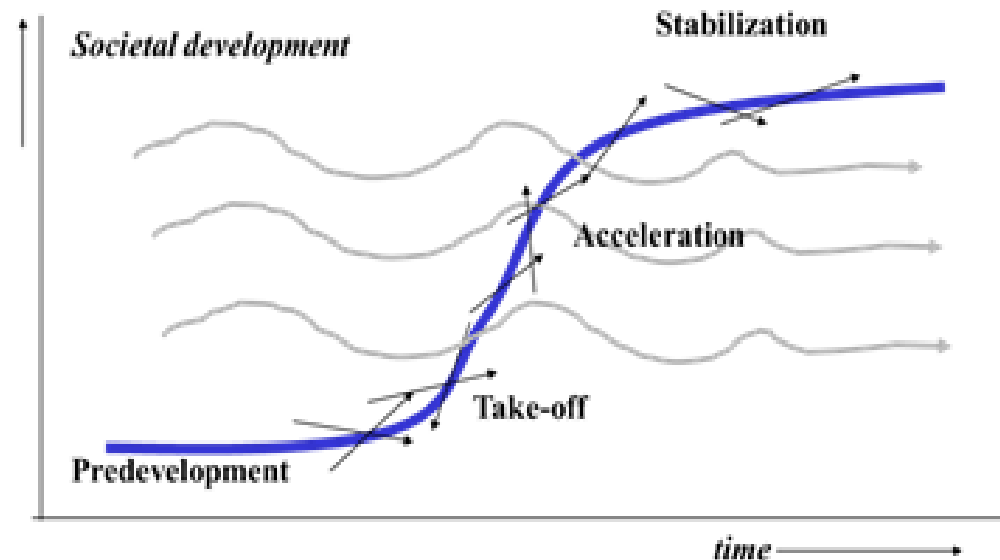
- + 1400 MW grid connected
  - 1,000 MW (2017-2020)
    - Horns Rev III 400 MW
    - Kriegers Flak 600 MW
- Near shore = 400 MW (2014-2015)
  - Grid connection from 2017



Land-based – 1800 MW  
(1300 repowering)

# The Past is not Prologue

- A new generation of technologies -- much taller turbines
- National & transboundary HVDC transmission lines on land and at sea
- Local siting conflicts on the rise
- Socio-technical system perspectives needed for energy system transitions



After Rotmans (2002)

# Ramping up offshore installations

- Delay land-based deployments
- Repowering
- Expensive choices

## **Nysted 165MW (2003)**

(on a nice day)

72 x 2.3 MW



# What the Heck is Ram Doing in Denmark?

- Examining community concerns and perceptions relating to land-based wind turbines
- Suggesting strategies for building a social science capability at DTU
  - Networking across national boundaries – Nordic & EU
  - Institutional collaborations
  - 8 universities
- Minimal quantitative and qualitative data available on public concerns & engagement strategies
  - Wind turbine syndrome vs. annoyance
- Caution about “pro” and “con” communities

# What the heck is Ram doing in Denmark?

- EERA wind sub-programme on economic and social aspects of wind integration
  - Approved in fall 2014
  - March 2015 workshop

<http://www.eera-set.eu/eera-joint-programmes-jps/15-eera-joint-programmes/wind-energy/>

- Wind 2050
  - Examining compensation packages
  - Developer practices
  - Controversy mapping & social media
  - Risks perceptions

<http://www.wind2050.dk/>

# What the heck is Ram doing in Denmark?

- Following the Danish cancer society study
  - Wind and cardiovascular diseases
  - Municipalities are postponing siting decisions
- Roskilde case study & interviews
  - No success in siting wind
- Noise monitoring at different sites
  - Extent of problem not known
  - Uncertainties on public health = annoyance?
- Radar & aviation lighting study at Østerlid test site
- Lecture series

# What Do We Need to Know?

- How will the needed knowledge base be created?
  - Guide the analysis of local controversies
  - Help decision makers respond to a changing social setting and technology advanced
  - Support spatial planning (land & sea)
- Who leads, funds, designs, and maintains?
- It needs to be robust:
  - Multidisciplinary
  - Based on science
  - Incorporates community concerns

# Building a Robust Knowledge Base

- 1) What is the nature of public perceptions and underlying values that will come into play in community responses to wind power development over the next 5-10 years?
- 2) How has social trust in developers and managers changed since the first generation of wind turbines were put in place?



# Building a Robust Knowledge Base

3) What have we learned about the dynamics of controversy and public concern from experience with siting wind turbines in Denmark and other countries?

4) Drawing upon the above, how may publics and communities be constructively involved and controversy avoided or resolved?

# Thank you



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